

13-0206

## NASA SLR Operatinal Network Project Overview

David McCormic

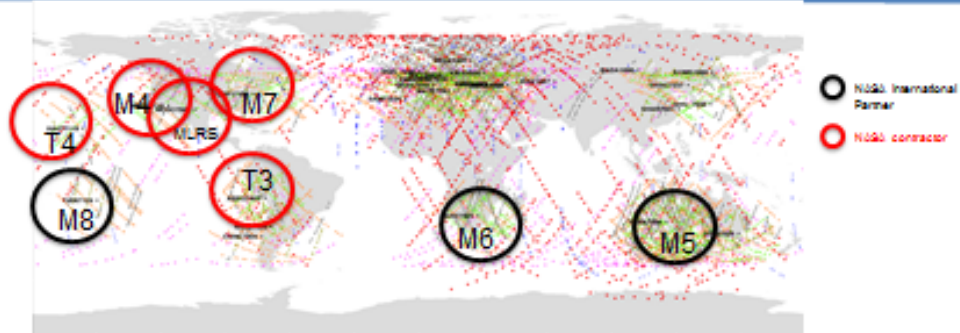
NASA Goddard Space Flight Center, Greenbelt, USA

[david.r.mccormick@nasa.gov](mailto:david.r.mccormick@nasa.gov)





# SLR Operations Status Summary



### Station Operations

- Maryland (M7)
- California (M4)
- Texas (MLRS) - Low Yield (tracking issue)
  - testing changes, engineering visit planned (laser, radar)
- Maui (T4) - Low Yield (tracking issue) - testing
- Peru (T3)
- Tahiti (M8) (CNES)
  - 2nd shift recently added
- S. Africa (M6) (HARTRAO)
- Australia (M5) (GA)

### Network Sustainment

- Obsolescence Replacement
- Resources - few network Engineers
- Site Ties and Monuments - Maui one cal pier - 2nd planned
  - M6 survey overdue - in planning stage

### Data Operations Center

- Hardware/software
- Hardening/improvements

### International Laser Ranging Service

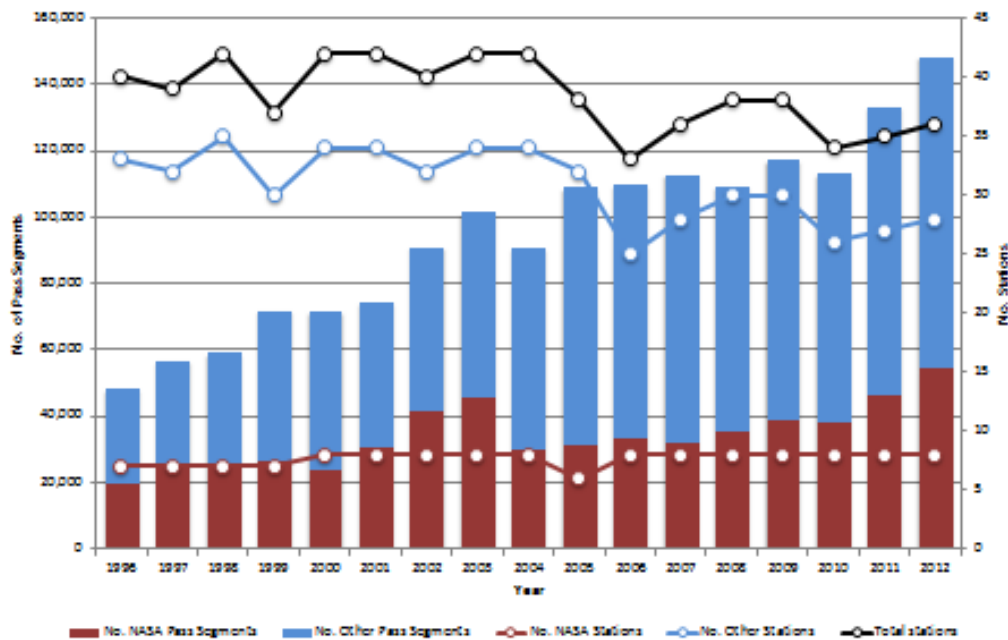
- Liaison /Central Bureau Management
- Data Analysis



# ILRS/NASA Yearly Data Yield

Network Manager: 10/24/12 September 2012

Draft: G. Carter, 10/11

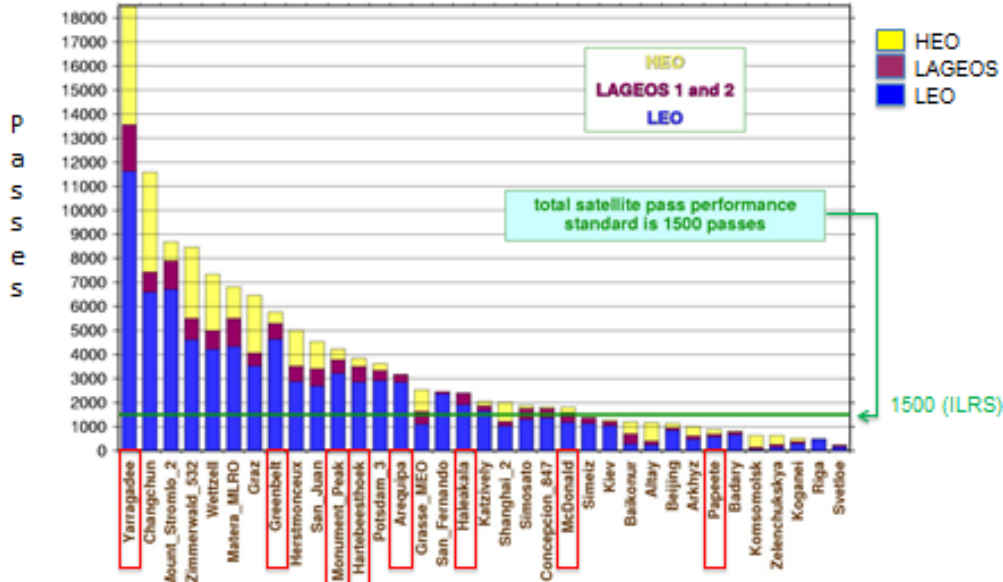




# SLR Data Quantity



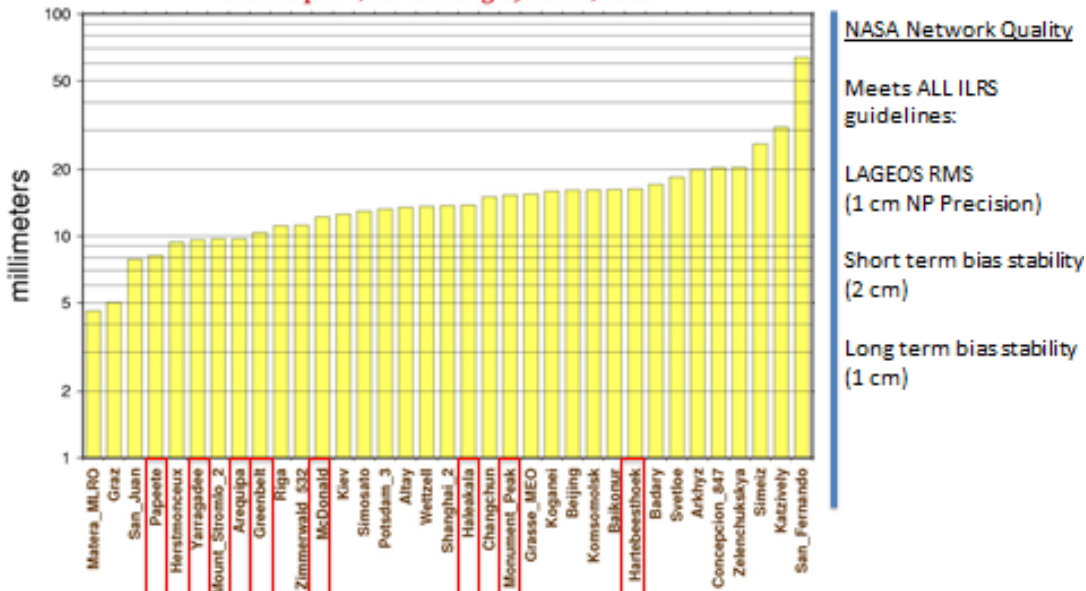
total passes  
from July 1, 2012 through June 30, 2013



# SLR Data Quality



LAGEOS RMS (single shot for satellite pass)  
from April 1, 2013 through June 30, 2013





- ◆ The NASA DOC advances since the last ILRS workshop
  - Conversion to CRD format processing (May 2012)
  - Daily analysis products require 24/7 connectivity/support
    - Improved redundancy and monitoring capability
    - Hardening of systems and management of processes
  - IT Security to industry standards
  - EDC/CDDIS comparison
  - QC standardization
  - Configuration Management of Hardware/SW/Processes
  - Re-Engineering Project
    - Obsolescence mitigation, process streamlining, reliability
    - Primary computer hot spare, added UPS for FTP server
    - Automation of manual processes, URL interface is planned

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## Greenbelt Operations Team



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# NASA Network Stations



- ◆ Peru (TLRS3) - Universidad Nacional de San Agustín (3 x 5 shifts)
  - REGINA collocated including survey
  - New LASER, EL axis repair
  - Improved yield
- ◆ Hawaii (TLRS4) – University of Hawaii (2 x 5 shifts)
  - Telescope mount refurbishment including survey
- ◆ California (MOBLAS 4) – EXELIS (2 x 5 shifts)
  - Site Survey performed
  - Refurbished RADAR



# NASA Network Stations



- ◆ Australia (MOBLAS 5) – Geoscience Australia (3 x 7 shifts)
  - RADAR at NASA for refurbishment
- ◆ South Africa (MOBLAS 6) – HARTRAO (3 x 5 shifts)
  - NASA training 2012
  - Refurbished RADAR
- ◆ Maryland (MOBLAS 7) – EXELIS (3 x 5 shifts)
  - Refurbished RADAR
  - Refurbished Mount Slip Ring
  - Supported Successful collocation with NGSRL
  - VLBI Mask (for RFI impingement)



# NASA Network Stations



- ◆ **Tahiti (MOBLAS 8) - CNES, Universite Franciase du Pacifique**
  - Repaired RADAR, servo system, HEO ranging amplifier
  - FTLRS Collocation 2011
  - 2 shift operation 2013
- ◆ **MLRS – University of Texas, CSR (2 x 5 shifts)**
  - Telescope adjustment, Revised controller software
  - Pending: New LASER, Radar refurbishment
  - Continued Leadership in Lunar Ranging and SLR Analysis



# NASA Network Stations Upgrades



- ◆ **Obsolescence Mitigation**
  - Limited funding
  - Highest risk components
- ◆ **RADAR**
  - Depot Level Refurbishment, Standardized Configuration
  - Improved Testing and Restricted Operational Modes
- ◆ **MOBLAS servo system**
  - Testing at NASA
- ◆ **Event timer**
  - Replaces time interval counter for all stations
  - Introduction 2014

Line	TRM Electronics	Software	Mechanics	Compass, IMU	IMU	Facility
1	Green	Yellow	Yellow	Green	Green	Green
2	Green	Yellow	Yellow	Green	Green	Green
3	Green	Yellow	Yellow	Green	Green	Green
4	Green	Yellow	Yellow	Green	Green	Green
5	Green	Yellow	Yellow	Green	Green	Green
6	Green	Yellow	Yellow	Green	Green	Green
7	Green	Yellow	Yellow	Green	Green	Green
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47	Green	Yellow	Yellow	Green	Green	Green
48	Green	Yellow	Yellow	Green	Green	Green
49	Green	Yellow	Yellow	Green	Green	Green
50	Green	Yellow	Yellow	Green	Green	Green



## NASA Lunar Laser Communications Demonstration



- ◆ LADEE spacecraft Launched September 6, 2013
  - Lunar Atmosphere and Dust Environment Explorer
- ◆ Lunar Laser Ground Terminal
  - ILRS Engineering Station
  - White Sands New Mexico
  - 4ea 15 cm transmitting telescopes
  - 4ea 40 cm reflective receive telescopes
- ◆ Passively tracked AJISAI several times allowing identification and correction of software issues
- ◆ Actively tracked AJISAI to check boresight alignment
- ◆ Immediately communicated with LADEE spacecraft for successful demonstration: 622 MBps downlink



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## SLR Operations Summary



- ◆ NASA SLR Network is functioning well
  - Deployment of obsolete component replacements will reduce risk of major network decline near term
  - Improvements in data quantity and quality are expected in 2014
- ◆ ILRS management and data analysis are functioning well
- ◆ Goals
  - Reduce risk of network downtime/failures by improving processes and proactively addressing obsolescence etc.
  - Improve data yield and quality
    - Event timer etc.
  - NASA DOC support ILRS daily data delivery with high proficiency

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July 8 Wildfire Monument Peak, CA

PHOTO Courtesy of HPWREN



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Please see our safety Poster!



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